

A¹ a drain pipe at least part of one end of which being made of a lower tube sheet part and the other end of which connected outside the heat exchanger to an immediately adjacent second fluid passing port passing the same fluid as the drain pipe.

A² 9. (Amended) A method for introducing or discharging part or a whole of the second fluid through the drain pipe and/or the vent pipe set forth in claim 1.

A³ 12. (Amended) A method according to claim 10, wherein the polymerizable substance is at least one member selected from the group consisting of acrylic acid, methacrylic acid, an acrylic ester, a methacrylic ester, an aqueous acrylic acid solution and an aqueous methacrylic acid solution.

Please add claim 17 as follows:

A⁴ 17. (New) A method according to claim 9, wherein the part of the second fluid is constantly or intermittently flowed.

Please cancel claims 2-4, 6-8 and 13-16.

REMARKS

The Office Action dated September 11, 2002 has been carefully considered. Claims 1, 9 and 12 have been amended. Claim 17 has been added. Claims 2-4, 6-8 and 13-16 have been cancelled. Claims 1, 5, 9-12 and 17 are in this application.

Support for claim 17 is found throughout the specification and in particular on page 10, lines 29 to 32 of the present application. No new matter has been entered.

Claims 2-4, 6-8 and 13-16 drawn to a non-elected species have been cancelled. Applicants reserve the right to file the cancelled claims in a divisional application.

Claims 1, 5 and 9-12 were rejected under 35 U.S.C. § 112 as indefinite for including terms which lack antecedent basis. Applicants have amended claims 1, 5 and 9-12 to obviate the Examiner's rejection.

Claims 1, 5, and 9 were rejected under U.S.C. § 102 (b) as being anticipated by U.S. Patent No. 1,848,197 to Ray et al. Applicants submit that Ray et al. do not teach or suggest the invention defined by the present claims.

Ray et al. disclose a heater to be used in conjunction with liquid evaporating and concentrating systems. A funnel like member 17 serves to seat cylindrical casing 23. Arranged between the casing 23 and the funnel like member 17 is a circular tube plate 30 which is operated to receive outlet tubes 32 for carrying off liquid of condensation.

In contrast to the invention defined by the present claims, Ray et al. do not teach or suggest that the drain pipe has at least part of one end being made of a lower tube sheet and the other end connected outside the heat exchanger to an immediately adjacent second fluid passing port for passing the same fluid as the drain pipe. To the contrary, Ray et al. teach that one end of the outlet tube 32 is connected with a circular tube plate 30, but the other end is free (see Fig. 1). There is no teaching or suggestion in Ray et al. that the other end of the drain pipe is connected outside the heat exchanger to an immediately adjacent second fluid passing port passing the same fluid as the drain pipe. As described on page 4, lines 22 to 29, by adopting the construction of the present invention, a part of the second fluid can be constantly or intermittently flowed, so that the fluid in the lower part of the heat exchanger will be fluidized, the overall heat exchange efficiency of the heat exchanger will be improved, and the sludge accumulated in the lower part of the heat exchanger will be discharged. Furthermore, the invention defined by the present claims is capable of repressing the occurrence of a polymer, which has been observed on the tube side in the shell-and-tube heat exchanger, as described on page 5, lines 7 to 11, and in particular Examples. Thus, the claimed invention is different from Ray et al., in that the other ends of the outlet tubes 32 are free in Ray et al., and the present advantageous effects are neither taught nor suggested in Ray et al.

Claims 1, 5, and 9 are rejected under U.S.C. § 102 (b) as being anticipated by Kister (Kister, Henry Z, Distillation Operation, pp. 462-467, McGraw-Hill, Inc., 1990).

Kister discloses in Figure 15.10(b) tubesheet vents in which one end of the vent is connected with the tube plate, but the other end is free. However, Kister does not teach or suggest that the drain pipe has at least part of one end being made of a lower tube sheet and the other end connected outside the heat exchanger to an immediately adjacent second fluid passing port for passing the same fluid as the drain pipe. For similar reasons

described above with regard to Ray et al., the invention defined by the present claims is different from Kister and has advantages not taught or suggested in Kister.

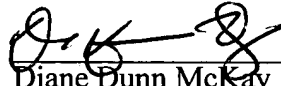
Claims 10-12 are rejected under 35 U.S.C. § 103 as being unpatentable over Ray et al. or Kister in view of U.S. Patent No. 3,520,661 to Grobe et al.

Grobe et al. teach polymerizable compounds (column 1, lines 29 to 33) and apparatus for solvent polymerization, (col. 1, lines 28 to 30). The apparatus eliminates the need of stirring and prevents backward mixing caused by stirring (col. 1, lines 24 to 25). This phenomenon may be based on the arrangement of parallel tubes 2 in the polymerization reactor 1, in which a plurality of cooling units are arranged in at least two groups disposed in the reactor transversely to the main flow direction. However, Grobe et al. do not teach or suggest a vent and/or drain pipe structure, as defined in the present claims. In addition, the subject fluid to be treated is different from the present invention in that the present invention aims to treat the second fluid through the shell. In contrast, Grobe et al. aim to treat the first fluid flowing through the tube of the present invention. Further, Grobe et al. teaches away from the present invention by teaching a process and apparatus for polymerization. In contrast, in accordance with the present invention, polymerization can be prevented. In the construction of Grobe et al., the problems overcome by the present invention would not occur. Thus, Grobe et al. do not cure the teachings of Ray et al. or Kister, and the present invention is neither taught nor suggested by Ray et al., Kister, and Grobe et al., alone or in combination thereof.

In view of the foregoing, Applicants submit that all pending claims are in condition for allowance and request that all claims be allowed. The Examiner is invited to contact the undersigned should he believe that this would expedite prosecution of this

application. It is believed that no fee is required. The Commissioner is authorized to charge any deficiency or credit any overpayment to Deposit Account No. 13-2165.

Respectfully submitted,



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VERSION WITH MARKINGS TO SHOW CHANGES

1. (Amended) A vertical heat exchanger comprising:

a pair of a first fluid passing ports for flowing through a tube;

a pair of a second fluid passing ports for flowing through a shell;

a vent pipe at least part of one end of which being made of an upper tube sheet part and the other end-of-which-connected outside the heat exchanger to an immediately adjacent second fluid passing port passing the same fluid as the vent pipe; and ~~/-or~~

a drain pipe at least part of one end of which being made of a lower tube sheet part and the other end of which connected outside the heat exchanger to an immediately adjacent second fluid passing port passing the same fluid as the drain pipe.

9. (Amended) A method for introducing or discharging part or [the] a whole of the second fluid through [a] the drain pipe and/or [a] the vent pipe set forth in claim 1.

12. (Amended) A method according to claim 10, wherein the polymerizable [material] substance is at least one member selected from the group consisting of acrylic acid, methacrylic acid, an acrylic ester, a methacrylic ester, an aqueous acrylic acid solution and an aqueous methacrylic acid [solusion] solution.

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